United States Department of Agriculture

Forest Service

Shasta-Trinity National Forest Headquarters

Forest Health Protection, Northern California Shared Service Area

3644 Avtech Parkway
Redding, CA 96002
(530) 226-2500
(530) 226-2490 – TDD
www.fs.fed.us/r5/shastatrinity

File Code: 3420 **Date:** May 29, 2009
Route To:

Subject: Annosus root disease at McBride Springs Campground, Shasta-McCloud Management Unit (FHP Report No. N09-03)

To: Sharon Heywood, Forest Supervisor, Shasta-Trinity National Forest

On May 1, while looking for field sites for our upcoming Forest Insect and Disease training session, Don Owen (CALFIRE Pest Management Specialist) and I visited McBride Springs Campground at the Shasta-McCloud Management Unit. The campground is fairly small, with 11 campsites, and is in a mixed conifer stand of white and red fir, ponderosa pine and incense cedar. During our brief visit, we noticed groups of dead and dying white and red fir in the campground and identified fruiting bodies of *Heterobasidion annosum* in nearby stumps, indicating the presence of annosus root disease. This discovery was of great concern, because root disease-infected trees often fail, and are considered highly hazardous in campground settings. Annosus root disease causes a root and butt rot in true firs, and even trees that appear green and healthy can have enough decay to fail.

H. annosum spreads underground across root-to-root connections from one host tree to the next, and also aerially by spores that infect fresh tree wounds and cut stump surfaces. Confirmation of the disease is best done by finding fruiting bodies ("conks") of the fungus in nearby decayed stumps or by finding fungal pustules or small fruiting bodies ("popcorn conks") on the roots of seedlings or saplings that are adjacent to decayed stumps or dying trees. Unfortunately, these fruiting bodies are often difficult to find, and lack of readily identifiable conks does not necessarily mean that the root disease is not present. Presence of laminated decay in the stumps, with pits on one side of the laminations and a smooth surface on the other, is indicative of the root disease fungus, though not conclusively so.

The dead trees in the disease centers were all white and red fir, indicating that the root disease fungus that is present is of the "S-group" biological species of *H. annosum*, which infects true firs, giant sequoia, hemlocks and Douglas-fir (though Douglas-fir is fairly disease-tolerant). Pines and incense-cedar are not affected by the S-group of *H. annosum*, but are susceptible to the "P-group" biological species of *H. annosum*, which does not appear to be present at McBride Springs Campground.

During our initial visit, Don Owen and I also identified fir engraver beetle (*Scolytis ventralis)* in many of the dead and dying fir. The fir engraver beetle often attacks firs that are under stress, including trees that are infected with root disease. Western dwarf mistletoe *(Arceuthobium campylopodum)* was found in some of the ponderosa pine, and incense-cedar rust

(Gymnosporangium libocedri) was present in some of the incense-cedar. These two disease situations, however, are relatively minor in comparison to the threat posed by annosus root disease.

On May 11, entomologist Cynthia Snyder and I accompanied Dave Trevisan and Valerie Hall of SMMU to further assess the situation. During the initial phase of our visit, we identified nine groups of dead and dying true fir scattered throughout the campground and found *H. annosum* conks in stumps in two of the groups. Stumps associated with all of the disease centers exhibited laminated decay that was highly suggestive of annosus root disease. Because the disease centers were spread throughout the campground, after a while we stopped identifying the individual pockets of mortality, concluding that the area was generally infested. Most of the dead and dying fir had also been attacked by the fir engraver beetle (*Scolytis ventralis)*. Galleries of the fir engraver beetle were readily identified in trees that had been cut down in the past.

Figure 1. Group of dead and dying white fir at McBride Springs Campground.

Figure 2. White fir stump near Campsite 9 with *Heterobasidion annosum* fruiting bodies.

Figure 1. *Heterobasidion annosum* fruiting bodies in stump near Campsite 9.

Recommendations

In general, when confronted with an annosus root disease infestation in a developed recreation area, where tree failure has the potential to cause injury or property loss, there are only limited alternatives to deal with the problem. One is to close the campsites within falling distance of infected trees (removing the target) or to remove all host trees within a buffer zone of 30-50-feet of known infected trees. The latter alternative (removing infected and buffer trees) can be difficult to implement, because the root disease is difficult to diagnose in individual trees, and because the infestation may be so widespread that very few host trees may be left after trees are removed from all of the buffer zones. Planting of disease-tolerant or non-host trees or shrubs is often recommended to regenerate the stand and lessen the visual impact of the tree removal.

At McBride Springs, the root disease centers are spread throughout the campground, so closure of individual campsites will not be effective. The whole campground will need to be closed or treated. Removal of trees 30-50-feet from identified root disease centers would result in the removal of almost all of the fir trees in the campground, so distinguishing root disease/buffer areas from non-diseased/buffer areas is impractical in this case. With these factors in mind, I can give the following recommendations:

1. Close the campground until management options are considered and implemented. If the decision is made to treat the campground (rather than closing it permanently), then implement items 2-5:
2. Remove all true fir of all sizes within falling distance of the campground. The purpose of this is to both eliminate the immediate hazard problem and to allow the fungus to die out of the remaining stumps so that the root disease problem does not return. This dying-out process could take up to 35-50 years. While the small fir do not currently contribute to the current hazard situation, if they are allowed to remain, these trees may become infected as their roots encounter the roots of infected stumps, producing new hazards as they grow. These newly-infected trees will also maintaining the presence of the root disease in the campground.
3. Remove all naturally-occurring true fir regeneration for about 35-50 years, allowing *H. annosum* to die out.
4. Treat all freshly cut conifer stumps with a borax compound ("Sporax") in accordance with FS Manual 2303.14. While this will not affect the infestation that is already established, it will prevent further introduction of *H. annosum* into uninfected conifer stumps.
5. While the presence of ponderosa pine and incense cedar will reduce the negative aesthetic effects of the removal of all true fir, the wooded character of the campground will be greatly altered. Planting with non-S-group-host tree species (including ponderosa pine and incense-cedar) and shrubs may be considered. Do not plant true fir, giant sequoia or hemlock. Use of a tree spade would allow the introduction of larger trees and shrubs.

Please feel free to call if you have any questions regarding this report.

PETE ANGWIN
Plant Pathologist
Forest Health Protection
Northern California Shared Service Area

CC: PRICILA FRANCO, ED HATAKEDA, DAVE TREVISAN, ED DOMANSKI, DONNA SAGER, DON LEE, VALERIE HALL, CYNTHIA SNYDER, DON OWEN, JULIE LYDICK, PHIL CANNON, SHERI SMITH